Righteousness in Early Christian Literature: Distant Reading and Textual Networks

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Abstract
The article joins the scholarly discussion about the meaning of righteousness language in biblical literature with consideration of changes in the concept from archaic Greek literature to fourth century Christian texts. The article seeks to showcase and evaluate how methods from the area of computational linguistics and distributional semantics can contribute to the discussion. The article suggests that, together with formal network models, namely word co-occurrence networks and similarity networks, the methods reveal changes in large corpora of

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1 This research article is a part of The Cultural Evolution of Moralizing Religions in the Ancient Mediterranean: A Distant Reading Approach project (Czech title “Kulturní evoluce moralizujících náboženství ve starověkém Středomoří: Přístup distančního čtení”) (GA20-01464S) funded by the Czech Science Foundation (GAČR). Authors who received funding from this project are VK, TG. NN’s project “Paul’s Ideas and the Ideas of Paul in Cultural Evolution” is funded by the Finnish Academy.
textual data which are too subtle to be detected by close reading. On the other hand, some questions require or benefit greatly from combining distant and close reading methods.

**Keywords**
righteousness, Paul of Tarsus, quantitative textual analysis, computational linguistics, distributional semantics, word co-occurrence networks, similarity networks

I. Introduction

The study of righteousness terminology from the perspective of Christian theology has generally taken the apostle Paul’s thinking as a focal point. Paul is also at the center of this article although we will look at changes in righteousness terminology from a wider perspective. A traditional, nowadays outdated view held that Judaism was a religion of “works righteousness” which Paul replaced with a merciful God who either declared or made the undeserving people righteous through the atoning work of Christ. In this view, righteousness was understood in a legal and normative sense. Since the 1970s, especially through the influence of E. P. Sanders, the so-called New Perspective on Paul has stressed that righteousness was, both in Judaism and in early Christianity, a *relational* term denoting membership in God’s covenant. This perspective has emphasized the origin of the relational meaning of the \( \delta \kappa \) (\( \delta \kappa \))-word group in the Hebrew \( \pi \tau \kappa \) (\( \pi \tau \kappa \)) rather than in the extra-biblical Greek, with the latter still considered normative and judicial. Recently, the strong dichotomy between the relational and legal interpretations has been questioned, for example, by Michael Seifrid and Charles Lee Irons. Other debates concerning biblical righteousness language have centered on the *salvific vs. punitive* understanding of the term, that is, whether God’s righteousness denotes the actions by which he redeems his people (due to his covenant faithfulness) or the punishments he metes out for wrongdoers. The debate concerning *declarative/imputed vs. infused* righteousness has a long history as well, although modern scholarship seems quite unanimous in locating this dichotomy in the later debates between Protestantism and Catholicism.

This article aims to contribute to the debates concerning righteousness terminology in early Christianity by demonstrating the potential of the distant reading approach to the topic. The crucial part of this demonstration is providing a comparison of the results obtained by these quantitative methods from the area of computational linguistics and distributional semantics to those obtained by close reading, i.e., an established method of reading and interpreting individual texts. In addition to this methodological validation, we discuss the potential of distant reading to reveal trends in large corpora of textual data that can be too subtle to be

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2 Sanders 1977.
4 The term distant reading was originally coined by Franco Moretti (Moretti 2013). Here we employ it in a broad sense to cover any computational text analysis method, especially when dealing with large portions of textual data (cf. Jänicke et al. 2015, Underwood 2017).
5 For a comparable approach see Špiclová and Kaše, 2020.
detected by close reading as well as the limits of this quantitative methodology. The article employs a comprehensive corpus of publicly available ancient Greek texts from the Homeric period to Late Antiquity which includes archaic and classical Greek, Jewish, Pauline, and other early Christian literature.

In the following, we first introduce the datasets and outline the methods employed in the quantitative part of the article. Subsequently, we discuss righteousness terminology in pre-Christian Greek sources, combining insights obtained by close and distant reading. An overview of righteousness terminology in the Hebrew Bible is also provided for contextualization, although the quantitative analysis is implemented solely on Greek texts. After this, we look at righteousness terminology in the Septuagint, which is considered to have an important role in mediating between the Hebrew Bible and Paul. Further, we look at Paul’s use of the key term and provide examples of how textual network analysis can contribute to the main scholarly debates on the matter. Finally, we contextualize Paul’s usage in comparison with other early Christian and Jewish authors of the Roman period.

II. Data and Methods

1. Datasets

The most important dataset for this article is a corpus of digitalized and publicly available ancient Greek texts named LAGT (Lemmatized Ancient Greek Texts).\textsuperscript{6} LAGT combines together textual data from two open-access resources.\textsuperscript{7} In total, it consists of 1,457 works, 2,891,346 sentences and 31,248,866 words.

Each work within the corpus is associated with particular metadata (e.g., work title, author name etc.). Most importantly, each work has been assigned a unique CTS URN identifier,\textsuperscript{8} which has allowed us to enrich the dataset by some additional metadata like cultural provenience (Christian, Jewish, or Pagan) or date. The date is typically expressed by means of one or two centuries (e.g., 4 c. BCE or 2/3 c. CE).

Some of the works in the corpus are either not suitable for our task at hand, because we miss important metadata for them (especially dating), or they are not relevant with respect to our research questions, because they originate from a very late period. Therefore, we mainly rely on a subselection from the corpus, consisting of texts which are dated within the range from 8 c. BCE to 4 c. CE (1,255 documents, 1,783,275 sentences, 21,086,074 words).

For most of our analysis, individual works have been grouped by authors. In some cases, we group together texts produced by more than one author, but which are sensible to treat together. For instance, we group together “Johannine literature”, taking together the

\textsuperscript{6} Kaše 2021a.
\textsuperscript{7} In particular: Cerrato et al. 2020 and Crane et al. 2020.
\textsuperscript{8} Blackwell and Smith 2019.
Gospel of John and the three New Testament epistles associated with this name (1–3 John).  

Finally, we also group together the whole Septuagint or all minor New Testament texts which are not of crucial interest to us.

In addition to LAGT, we also work with PHI, a comprehensive dataset of ancient Greek inscriptions. In total, it contains 218,162 inscriptions, 309,734 sentences, and 4,419,743 words. For 131,904 of the inscriptions, we were able to extract some sort of numerical dates, which allows us to explore some temporal trends in the data. To combat the substantial extent of uncertainty in dating (i.e., an inscription is commonly dated to a range covering one or even more centuries), we use a Monte Carlo model, which is an iterative mathematical tool for exploring probability distributions. It allows us to compare our results across 100 possible versions of the dataset, each containing a varying set of possible dates of origins for the inscriptions estimated based on their date ranges. This approach allows us to analyze together both rather broadly and precisely dated inscriptions. Having these simulation variants, we can then ask whether a temporal trend of our interest is present across all of them or not. Following this, we group inscriptions within each variant by century and inspect what trends are robust across the simulation variants. In Figure 2-(b), we visualize results for each simulated variant of the dataset as one line. Places where the curve representing one word is thicker represent periods with lower extent of temporal uncertainty and therefore enable more inference.

2. Data preprocessing

Before we delve deeper into these datasets, it is useful to explain some basic terms and methods on which the following analyses rely. First, to produce valuable results, distant reading methods require the textual data to be preprocessed in a certain way. Usually, the textual data have to go through tokenization, part-of-speech analysis (or: pos-tagging), and lemmatization.

Tokenization refers to a procedure of dividing the raw text into its constitutive parts. In our case, it takes place on two levels. First, the whole work is split into sentences. Subsequently, each sentence is divided into individual words, i.e., tokens. Pos-tagging is a set of algorithms assigning to each word its part-of-speech (POS) tag, i.e., whether a word in a sentence is a substantive (SUBS), adjective (ADJ), verb (VERB), punctuation (PUNCT), etc. Pos-tagging algorithms usually work in a probabilistic manner, assigning a tag for a word on the basis of the context of the sentence in which the word appears. These algorithms usually rely on some sort of machine learning, in which the algorithms are first trained on manually encoded data. Lemmatization is a process during which a word is coupled with its base (dictionary-like) form: e.g., Χριστοῦ is coupled with Χριστός (Khristos, ‘Christ’), ἐστιν with εἰμί (eimi, ‘to be’), etc. In most cases, this transformation can be done rather straightforwardly by means of a word-lemma dictionary. But there is also a significant number of instances in which this process is

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11 For details, see Kaše 2021b. For instance, in one simulation variant, an inscription dated to a hellenistic period (i.e., an inscription which could be produced at any time between 330 BCE and 30 BCE.) will be dated to 3rd c. BCE, while in another simulation variant the same inscription will be treated as being produced during the 2nd c. BCE. See https://github.com/sdam-au/PHI_ETL.
more complicated. For instance, a word found in a text might be either a substantive or a verb and therefore refer to two different lemmata. To deal with this issue, our lemmatization algorithm assigns lemmata on the basis of the pos-tags.

As a result of preprocessing, we obtain the textual data in a form in which each work is represented as a list of sentences and each sentence as a list of tokens. A token consists of the word itself, its pos-tag, and its lemma. Finally, we filter for words tagged as substantives, proper names, adjectives, and verbs, and extract their lemmata. We choose these types of words since we consider them to be loaded with the highest semantic value. This sort of filtering represents an alternative to stop words filtering \(^\text{12}\). As an outcome of this extraction, for each work in the dataset, we finally obtain two versions of the textual data to be employed in all subsequent analyses: (a) lemmatized sentences: a list of sentences, with each sentence representing a list of prefiltered lemmata; (b) lemmata: a flat list of prefiltered lemmata, i.e., the same as (a), but without sentence divisions. \(^\text{13}\)

Before we conclude this section, we have to be aware that because of the fact that the pos-tags and the lemmata are assigned automatically in a probabilistic manner and because the input textual data is highly diverse in genre, dialect etc., the performance of the pos-tagging and lemmatization algorithms is far from being perfect. Consequently, the usefulness of the resulting data always depends on the scale of the task at hand: to analyze a particular sentence from a work improperly tagged might cause serious problems, but once we make an analysis comparing large subcorpora, these minor issues should not skew the overall results.

In the following few sections, we will introduce a series of methods which will be employed below in the analytic part of the article. First, we will describe some methods based on word counts and frequencies. A special attention will be paid to the TFIDF algorithm, which enables to analyze word frequencies within one part of a corpus in respect to the corpus as a whole. Subsequently, we will shortly introduce a set of models approaching language data as vectors and matrices which might be analysed by means of standard operations from linear algebra. This approach is especially valuable in allowing us to capture different types of relationships between words on a semantic level. Finally, we will introduce word-occurrence and similarity networks, which combine the above mentioned approaches with the methods of formal network analysis and visualization.

On a technical level, all distant reading analyses introduced in this article were implemented using Python 3 programming language. \(^\text{14}\) Most of the scripts have a form of jupyter notebooks, consisting of independently executable cells, which facilitates easier code reusability. \(^\text{15}\) All of the files are now publicly available online inviting future reuse. The scripts used to preprocess the data are part of the respective data repositories mentioned above. \(^\text{16}\) The

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\(^\text{12}\) Stop words filtering is a process of elimination of specific words from quantitative textual analysis. Usually, stop words are the most common words in a language without any significant semantic load such as prepositions, conjunctions etc.

\(^\text{13}\) All these preprocessing procedures were done by means of a set of scripts accessible in the LAGT repository on GitHub: https://github.com/sdam-au/LAGT.

\(^\text{14}\) Van Rossum and Drake 2009.

\(^\text{15}\) Kluyver 2016.

\(^\text{16}\) See esp. Kaše 2021a.
scripts containing the analyses introduced below are included in a repository accompanying this article. In the repository, there are also some supplementary figures and tables.

3. Word counts, frequencies, and TFIDF

Almost every distant reading analysis has to start with counting individual words. Comparing word counts for several words over the whole corpus can bring interesting insights (cf. Table 3 below). However, once we want to compare how certain words are used in different parts of the corpus, raw counts become insufficient, since the count depends on the size of these parts. This limitation might be overcome by term frequency (TF), in which the word count is divided by the total number of words. Therefore, when comparing usage of certain words across different parts of the corpus (for instance, comparing differences in usage between individual authors or from one century to another), we usually employ term frequencies, at least as a first step.

Looking at words with the highest TF, we usually realize that they tend to include generally widespread but semantically uninformative words, like εἰμί (‘to be’). In order to overcome this limitation in part, we can employ TFIDF. In this algorithm, TF of a term within a specific part of a corpus is weighted by its distribution over the corpus as whole. This weighting is done by multiplication of TF by inverse document frequency (IDF). Document frequency is calculated as a number of documents containing the term. This value is then inverse and logarithmically normalized.

\[ \text{TFIDF} = \frac{TF \times \log_2(IDF)}{ \text{IDF} } \]

TFIDF is a very efficient measurement for capturing terms highly specific for a certain part of a corpus or text. Below we repeatedly use this measurement to look at a certain number of words with the highest TFIDF values within preselected textual contexts of our interest.

4. Word co-occurrences and vectors

According to distributional semantics, the meaning of a word is defined by its context of usage. A context of usage might be operationalized in several different ways. One approach is to approximate it by means of sentences containing the word. Following this, in the subsequent analyses, we repeatedly focus on words co-occurring together within sentences. An alternative is to focus on n-grams or concordance windows of certain width surrounding the word.

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17 Kaše, Nikki, and Glomb 2021.
19 N-gram is a sequence of a certain number (N) of co-occurring words in a text. A concordance window is a word context surrounding a selected word in a text. The width of the window defines how many words before or after the selected word are included.
This simple logic stands behind a whole research area of vector semantics. Perhaps the most important language model using vectors is word-document matrix, in which each row represents a word occurring within a document collection (i.e., its vocabulary) and each column represents a document within the collection. In many common applications, documents are equal to sentences within the collection. Individual cells then express the number of times a word appears within a document, i.e., a sentence. This matrix representation can be easily transformed into a second important vector model, word-word co-occurrence matrix, capturing how often any two words appear together across all sentences. These two matrix representations form the background for a broad variety of methods from the area of distributional semantics, some of which will be introduced below.

Analyzing the data in terms of vectors allows us to employ a broad palette of mathematical techniques from linear algebra. Simply speaking, treating a word as a vector means that we assign to it a position within a multidimensional space. This technique is known as word embedding and there are currently many approaches on how to generate such embeddings. In its most simple form, a vector corresponds to row values within a word-document matrix, where each document corresponds to one dimension in this multidimensional space. It is then supposed that words with a similar position within this multidimensional space are also semantically closely related. A simple example might help to make this better understandable. Let suppose that our document collection consists of the first two verses of the Gospel of John in English translation (NRSV):

In the beginning was the Word, and the Word was with God, and the Word was God.
He was in the beginning with God (John 1:1–2).

In this case, the document-term matrix will consist of two columns, determined by the number of documents in the collection. The number of rows will be determined by the size of the vocabulary we choose to work with. In our example, we can decide that our vocabulary will consist only of two words: “Word” and “God”. The word “Word” appears three times in the first document, but is completely missing in the second one. Therefore, the corresponding cells have the values 3 and 0. “God” appears two times in the first document and once in the second document. Therefore, the corresponding cells have the values 2 and 1 (see Table 1).

<table>
<thead>
<tr>
<th>word</th>
<th>J 1:1</th>
<th>J 1:2</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Word”</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>“God”</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 1: Word-document matrix example.*

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20 Jurafski & Martin 2017.
21 E.g. Latent Semantic Analysis (LSA) (Deerwester et al. 1990; Landauer et al. 2007) and word2vec (Mikolov et al. 2013).
22 Cf. Czachesz 2017, who uses the same two verses to explain word occurrence networks.
These cell values might be approached as defining direction and magnitude of two groups of vectors: (1) row vectors, representing each word in the vocabulary as a vector in space with number of dimensions equal to the number of documents; (2) column vectors, representing each document in the corpus as a vector in space with number of dimensions equal to the number of words in the vocabulary. Since our corpus consists of two documents, the word vectors are defined only by means of two components, what makes possible to plot them directly within a 2-dimensional space, where the value for $J_{1:1}$ of given words defines its $x$ axis vector component, while the value for $J_{1:2}$ of that word defines its $y$ axis vector component. If you have a large number of words distributed across a large number of documents (sentences), this sort of approach might be applied to detect semantic similarities between words. By analogy, the same approach might be applied on the column vectors, which represent individual documents. In this case, the number of dimensions of the vectors corresponds to the number of words (i.e. number of rows of the matrix). This sort of method can be used to compare similarity between documents based on the vocabulary they employ. Figure 1 demonstrates both approaches. On Figure 1-(a) the vectors represent individual words and the documents define the axes, on Figure 1-(b) the vectors correspond to the documents and the words define the axes.

![Figure 1: (a) words as vectors example; (b) documents as vectors example.](image)

In the example above, the word-document matrix was based on word-counts. But it is important to realize that we can easily build a word-document matrix based on the TFIDF values. This approach is adopted below when we compare the usage of righteousness terminology across authors in a corpus of early Christian texts.

As already mentioned, the word-document matrix can be easily transformed into the so-called word-word co-occurrence matrix, capturing how often any two words appear together across all documents within the collection. However, there are again a few different versions of the matrix. Strictly speaking, if we consider all their instances independently,

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23 In that respect, it is important to realize that, for example, the Pythagorean theorem, which might be used to calculate this magnitude) is equally applicable also for calculation of vector magnitude in a higher-dimensional space.

24 In linear algebra terms, it is achieved by multiplication of the document-term matrix by its transpose (Strang 2016, 112–113).
“Word” and “God” co-occur 6-times in our document collection. However, in some applications, it makes more sense to count their co-occurrence within a document only once. Further, we have to consider what values should constitute the diagonal of the matrix. Depending on the application, it might be either a) zeros, b) ones, c) number of documents within the collection containing the word or d) the total count of the words within the collection (see the results for all these four options in Table 2).

<table>
<thead>
<tr>
<th></th>
<th>“Word”</th>
<th>“God”</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Word”</td>
<td>0 or 1 or 1 or 3</td>
<td>6 or 1</td>
</tr>
<tr>
<td>“God”</td>
<td>6 or 1</td>
<td>0 or 1 or 2 or 3</td>
</tr>
</tbody>
</table>

Table 2: Word-word co-occurrence matrix example.

5. Word co-occurrence networks and similarity networks

The methods outlined above might be fruitfully combined with formal network analysis methods. In this article, we mainly work with two types of networks: word co-occurrence networks and similarity networks. Word co-occurrence networks are networks generated from word co-occurrence data, e.g. in a form of a word co-occurrence matrix. Once we obtain a word-word co-occurrence matrix capturing how often any two words appear together in a predefined context (e.g., within all sentences from one author within our corpus), we can use this data to generate a network in a very straightforward manner. It is because a word-word co-occurrence matrix can be treated as an adjacency matrix defining a network. An adjacency matrix is a square matrix with both columns and rows equal to nodes of a network. A non-zero value within a cell indicates that there is an edge connecting the two nodes. In other words, whenever two words co-occur together within a sentence, there is an edge connecting the two words. Repeated co-occurrence of the same two words increases the weight of the edge.

We also construct a similarity network of authors. Similarity networks might be defined as networks in which the presence and weight of an edge is based upon similarity of the two nodes under consideration. Such similarity can be based on many different things. In our case, we construct a similarity network of authors with edges connecting authors using the term δικαιοσύνη (dikaiosynē, ‘righteousness’) in a similar way. This is based on a variant of a word-document matrix. The details of the procedure are explained below.

After this methodological section, we can turn to the analysis of righteousness terminology in the ancient Greek texts. We will proceed by combining insights based on the
history of scholarship, insights achieved by our own close reading of the sources, and insights
drawing on the quantitative methods sketched in this section. Initially, we will work mainly
with word counts, word frequencies and TFIDF. Later on, we will also employ some vector
and network based methods.

III. Analysis of righteousness terminology

1. Righteousness in archaic and classical Greek

The word δίκαιος (dikaios, ‘righteous’) and related terms are etymologically connected
with the verb δείκνυμι (deiknymi, ‘show’, ‘indicate’). Based on this, David Hill suggests that
the basic word in the group, δίκη (dikē), originally denoted ‘way indicated’ or ‘that which is
customary’. The earliest appearance of the word refers to the goddess Δίκη (Dikē), daughter
of Zeus (Hesiod, Works and Days, 256). According to Hill, Solon (ca. 630–560 BCE) was the
first to “demythologize” the term. For him it meant “a law, the law of the universe, which is
independent of man and cannot be evaded by him.” After Homer, the term became increasingly
connected to legal proceedings while also being used more widely in the sense of what is right
or just.


Hill distinguishes three stages in the use of the δικ-word group: the first word to appear was δίκη, then δίκαιος, and lastly δικαιοσύνη. According to our temporal overview of these three terms in LAGT and PHI (see Figure 2, (a)-(b)), it seems that the first two terms started to be used extensively at the same time. However, it is interesting to notice that the rise in the usage of δικαιοσύνη from the 5th to the 4th c. BC can be documented both in literary texts (LAGT) and in inscriptions (PHI) in approximately the same time. This proves that the usage of the term δικαιοσύνη was not limited to literary works.

Figure 2: Term frequencies (TF) of δίκαιος, δίκη and δικαιοσύνη across corpora and subcorpora. (a) LAGT; (b) PHI. In (a), the peaks in the usage of δίκη around 700 and 600 BCE, depicted as exceeding the y axis range, are based on a very small amount of data and therefore should not be given too much emphasis.

In the case of PHI (Figure 2-(b)), all simulated time series of the dataset are plotted together by means of a cumulative line plot. On the one hand, a high vertical dispersion of lines of the same color (e.g., lines plotting frequency of δίκη in the 7th and 6th c. BCE) indicates a high extent of temporal uncertainty in the data and therefore does not enable any meaningful inference concerning trends at the respective point in time. On the other hand, places where the

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32 Hill 1967, 100.
lines of the same color tend to be close to each other indicate a small extent of temporal uncertainty and therefore allow us to formulate robust inferences concerning trends in the data. Thus, we observe quite clearly that the usage of δικαιοσύνη increases extensively between the 5th and 4th century BCE. Taken together, this figure informs us that the term δικαιοσύνη was not unusually popular in Paul’s time, at the beginning of the Common Era.

Charles Lee Irons emphasizes that the term δικαιοσύνη was used in many senses in extra-biblical Greek, and that it included faithfulness as a subcategory of righteousness – making it unlikely that this was a purely Hebraic idea. Herodotus (5th c. BCE) is the first to use the term consistently, mentioning it eight times in five passages. He uses the term to denote, for example, honesty and justice in social situations and a personal quality (Hist. 6:86a, 7.164). It is also part of the collocation χράομαι δικαιοσύνη (khraomai dikaiosynē, ‘to practice righteousness’) which is how Herodotus describes the custom of keeping political contracts (Hist. 2.151). The term is also used together with πιστότης to denote faithfulness and loyalty (Hist. 7.52). Irons, who questions the early use of δικαιοσύνη as a relational concept, classifies faithfulness as only one “species of righteousness”. The term is also used by Herodotus of “the quality of justice on the part of a judge” (Hist. 1.96) which Irons (following Havelock) believes to reflect the original judicial and royal context of the term. Of other 5th century BCE authors, perhaps Antiphon is most interesting as he actually ventures a definition of the term. For him δικαιοσύνη denotes observing the law of one’s polis. According to Irons, this meaning of δικαιοσύνη as obedience to the law is common in extra-biblical Greek literature and is appropriated into Greco-Jewish literature, where the law is understood to be the Mosaic one.

In the 4th century, δικαιοσύνη was used broadly by both philosophers and rhetoricians, which makes it possible and meaningful to employ some distant reading methods. Here we introduce a simple comparison of the usage by Isocrates and Aristotle. Table 4 contains 10 terms with the highest TFIDF values within sentences containing the term δικαιοσύνη in the works of these two authors. In both cases, we see there two basic types of words: (a) semantically crucial words from the domain of morality and virtues (δίκαιος, ἀρετή, ἀδικία, ἀνδρεία, σοφροσύνη, ἀγαθός, εὐσέβεια, σοφία); (b) semantically less informative words like

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33 The term is used variously to denote distributive righteousness, a general virtue, and of the observance of the law and as the goal of the law, and as human virtue coming from gods and rewarded by gods (Irons 2015, 105–107).
34 Irons 2015, 106. This is in line with Irons’s overall argument which is to dismantle the dichotomy between relational and normative uses of righteousness (Irons 2015, 84).
35 In fact the earliest usage of the term in AGT is attested in Aesopica, conventionally dated to the 6th c. BCE.
36 Irons’s final aim is to demonstrate that Paul did not use the term δικαιοσύνη to denote in a covenantal and relational sense and to enable a “renewed ‘old perspective’ understanding of Paul’s ‘righteousness/justification’ terminology” (2015, 6). Irons understands righteousness in Paul as “the state of being legally recognized as dikaios before God, a state theoretically achievable by perfect good behavior and one which God requires of all humans if they are to avoid perishing and inherit eternal life”. To remedy this and provide salvation, God gave Christ as “extraordinary righteousness” (2015, 7).
37 For Herodotus, see Irons 2015, 87–89.
38 Fragment 87.44 in Diels & Krantz Die Fragmente der Vorsokratiker. Note that this Antiphon is not necessarily the orator Antiphon.
The proportion of terms in the first category covered here is striking. In both authors, the term with the second highest TFIDF within the sentences containing the term δικαιοσύνη is ἀρετή (aretē, ‘goodness’), which demonstrates that both authors use the term in the context of virtues. Furthermore, both Aristotle and Iscorates tend to use δικαιοσύνη together with σοφροσύνη. Finally, in the case of Isocrates, the algorithm captures a connection of righteousness with εὐσέβεια, while in the case of Aristotle we see an association with ἀνδρεία. It is also remarkable that in the case of Aristotle, δικαιοσύνη often appears together with other δικ-words.

<table>
<thead>
<tr>
<th>author</th>
<th>10 terms with highest TFIDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aristotle</td>
<td>δίκαιος, ἀρετή, ἀδικία, ἀνδρεία, σοφροσύνη, ἀγαθός, εἰμί, οἷος, ἄλλος, ἔτερος</td>
</tr>
<tr>
<td>Isocrates</td>
<td>σοφροσύνη, ἀρετή, εὐσέβεια, εἰμί, ἀδικία, σοφία, πολύς, ἔχω, μέγας, οὗτος</td>
</tr>
</tbody>
</table>

Table 4: 10 terms with highest TFIDF in Aristotle and Isocrates.

In addition to these words, the table also contains a number of terms from the second category – words with a lower semantic load. We encounter such terms repeatedly throughout the rest of this article. Some of them could perhaps be treated as stop words and excluded from the analyses. However, we keep them in for several reasons: first, they might have a semantic value in specific contexts; second, a decision to exclude a word from an analysis makes any quantitative analysis prone to cherry-picking (i.e., an activity with an attempt to skew the analysis to obtain deserved results by modifying the dataset).

The close association between righteousness and virtues in the works of Isocrates and Aristotle has also been observed by Irons. According to him, Aristotle makes a distinction between universal justice and particular justice. Universal justice denotes for him a superset of all virtue – as ἡ τελειά ἀρετή (1129b30, 1130a9–10) and is also defined as that which is lawful (1129a34). Particular justice on the other hand takes place in human interactions and denotes proportionality (1131b17–18), equality, and fairness (iustitia distributiva). According to Irons, there is thus a relational aspect to righteousness as Aristotle understands it (esp. 1161b6–7).

In Isocrates, piety (εὐσέβεια, eusebeia) is directed towards gods whereas righteousness (δικαιοσύνη) belongs to the sphere of human interaction. The distant reading method employed above (terms with the highest TFIDF values within sentences containing the

41 Eimi, ‘to be’; hoios, ‘such as’; allos, ‘other’; heteros, ‘other’, polys, ‘many’; exo, ‘to have’; megas, ‘large’; houtos, ‘this’.
42 For a similar understanding, see Plato, Resp. IV 433b.
43 See also Hill 1967, 99–100.
44 Irons 2015, 95.
45 Irons 2015, 91. A good representative of the same type of thinking from a later period is the first century BCE historian Diodorus Siculus, who uses the term δικαιοσύνη in many contexts. It represents moral goodness in “its most generic sense” (Hist. 1.2.8) and appears in the conventional pair εὐσέβεια καὶ δικαιοσύνη which covers human relations to both gods and other humans (Hist. 1.2.2. etc.) (Irons 2015, 106).
key term δικαιοσύνη) is unable to capture these types of semantic differences. This does not, however, mean that it cannot be done by applying some other distant reading methods. However, this would require a different type of input data, that is, dependency treebanks, which are annotated, syntactic trees of sentences. Using such data, we could focus on the syntactic position of δικαιοσύνη with respect to other terms of interest. Despite substantial progress on this front over the recent years, data annotated in this way are available only for a small subset of ancient Greek texts. Alternatively, we could focus on the usage of additional word types, such as prepositions, which have been excluded from the dataset as we employ it in this article.

2. Righteousness in the Hebrew Bible

Although the current article applies distant reading methods only to Greek terminology, it is necessary to shed some light on Hebraic righteousness language, as well. The use of the δικαίωμα-root by Paul and other early Christians is mediated through the Septuagint, which is (roughly) a Greek translation of the Hebrew Bible. Discussion of the Hebrew Bible word group rooted in קדש (ṣdq, translated with terms denoting righteousness) has revolved around two major issues. First, there is a seeming discrepancy between salvific and punitive uses of the term. Second, the term has been understood – like its Greek counterpart – to denote either “accordance with a norm” or “fidelity in a relationship.” Another discussion has revolved around the question of “ethical” vs. “forensic” uses, the latter meaning a declared or pronounced status of righteous and the former denoting enacted righteousness. As for the latter, it has been stressed that “forensic” interpretations are anachronistic, unrealistic, and reflective of later Catholic-Protestant debates.

Mark Seifrid has criticized any attempt to find a general meaning, a Grundbegriff, for a particular word-root, which would apply to all usages (i.e., word-equivalence). Instead, he stresses that terms should be viewed in their contexts, which actually determine their

47 The following meanings are offered by Brown-Driver-Briggs:
   · קדש sadiq: “just”, “righteous”, “right”, “correct”, “lawful”

49 Seifrid 2001, 422. Ziesler (1972, 22) thus: “When we speak of the forensic righteousness of an accused person, we mean he is innocent, not guilty… his righteousness or righteousness is a matter of status in, or relationship to the court. When a judge, however, is righteous or just, the reference is not so much to his status as to the way in which he acts in court.” See also Seifrid 2004, 66: “One simply does not find bare pronouncements in Hebrew Scriptures or in Paul. The biblical writers are interested in justice enacted.”
meaning. This emphasis resonates well with the approach of distributional semantics, which we employ in the distant reading parts of this article. Concerned by words in their context, Seifrid notes that קֶדֶצ very rarely appears together with תִירְבָּה (bērît, ‘covenant’), which severely problematizes the covenantal readings of the term. Seifrid thus denies that righteousness language is merely a Verhältnisbegriff denoting Gemeinschaftstreue, that is, a relational concept signifying fidelity to the covenant. Seifrid still admits the existence of a covenant connection, but one that is mediated through the language of love תֶדֶשׁ (ḥese) and loyalty נוּמֵא (ʾemûn). These terms appear more often in covenant context and fall under the overarching idea of righteousness. Thus “[a]ll ‘covenant-keeping’ is righteous behavior, but not all righteous behavior is ‘covenant-keeping.’”

Importantly, a relational and covenantal understanding of righteousness language has been used to emphasize the difference between the Greco-Roman and biblical uses of the term, respectively. Seifrid, like Irons above, emphasizes that such a dichotomy is not realistic – both Greco-Roman and biblical uses have normative and relational elements. There is a difference, however, in that God is portrayed as the source and executor of righteousness in biblical language. In a biblical understanding, righteousness cannot be conceived of or distributed without the involvement of God.

Seifrid also notes that תִירְבָּה terminology appears much more frequently with God’s ruling and judging activity (טפשׁ, šṭāṭ), which supports, for example, Hans Heinrich Schmid’s argument that righteousness language is primarily rooted in creational theology. Seifrid links the different aspects of righteousness to a view of God as “divine king, who has determined to secure the good and beneficial order of creation”, which explains the salvific overtones of the term as well as the joined judicial, legal, and executive acts of righteousness by God. Seifrid stresses that righteousness stems from God’s role and actions as creator, ruler, and judge of the entire earth – a perspective strengthened by the fact that gentiles, and not only Israelites, can also be connected to קֶדֶצ. God’s acts of righteousness “do not represent mere ‘salvation’ for Israel, or even merely ‘salvation.’”

As for punitive and salvific usages, the different forms of קֶדֶצ tend to reflect the different usages. The masculine פֶּדֶשׁ (ṣedeq) denotes the abstract concept of “right order” or “that which is morally right”, while the feminine פֶּדֶשׂ (ṣedāqā) is used of concrete matters such as “righteous acts” or “vindicating judgements”. The punitive form appears, according to

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51 Out of the 283 appearances of תִירְבָּה and 524 appearances of קֶדֶצ the two are linked together only seven times (Seifrid 2001, 423). The simple fact that Noah and Abraham were attributed righteousness before and outside the covenant is also telling (Seifrid 2001, 425). The Qumran literature, on the other hand, links righteousness and covenant, but stresses that righteous deeds in fact bring salvation (Seifrid 2001, 434–435). In rabbinic literature, obedience is also connected to covenant, while פֶּדֶשׂ begins to mean almsgiving (Seifrid 2001, 438–439).
52 Seifrid 2004, 43.
54 Seifrid 2004, 43–44.
55 Appearing together in 142 instances. Here Seifrid sides with Schmid’s (1968) suggestion that righteousness is closely related to creational theology (Seifrid 2001, 425–426).
56 These functions are joined in the ancient world in general (Seifrid 2001, 426–427).
58 Seifrid 2001, 428.
Seifrid, altogether 15 times in the Hebrew Bible, the majority of the occasions referring to God as a righteous (קדש ),$d$aq$) judge who punishes the wicked,$^59$ The feminine קַדְצ (שָׁדַף$^60$, on the other hand, appears in vindicative connections.$^61$ Seifrid, in fact, suggests that the emphasis on this feminine form as “actual righteousness” hindered older scholars from detecting the punitive connections.$^62$ Irons, however, emphasizes that God’s enactment of justice has both punitive and salvific elements: “righteousness of God” refers to “God’s justice in executing judgment on the enemies of his people and thereby vindicating his people in the face of their oppressors.”$^63$

3. Righteousness in the Septuagint

The Septuagint translates the Hebrew root קַדְצ quite consistently with forms of δικαιοσύνη/δίκαιος: out of the 476 possible instances 462 are translated with the term.$^64$ Of the existing 139 appearances of the קַדְצ root in the book of Psalms, for example, the Septuagint translates 136 with forms of δικαιοσύνη/δίκαιος and 3 with forms of ἐλεημοσύνη (ἐλεός, ‘mercy’).$^65$ (The δι- root itself appears altogether 1791 times in the Septuagint.$^66$) This faithful equivalence has led some scholars to suggest that the δι- root in the Septuagint receives its semantic meaning, not from extra-biblical Greek, but from the allegedly relational/covenantal Hebrew קַדְצ.$^67$ David Hill, for example, suggests that the δι-words “underwent considerable expansion and change of meaning through being consistently used to render the Hebrew root קַדְצ”, and one of these changes was that the term acquired the meanings of mercy, loyalty, and faithfulness in covenantal contexts.$^68$ As became evident above, this interpretation of the Hebrew term has been strongly criticized lately, which puts the idea of δικαιοσύνη as a calque (a loan translation) in dubious light.$^69$ According to Irons, covenant faithfulness “is not one of the Hebraic meanings that has been introduced into the Greek δι- group among Greek speaking Jews or Christians of the period under investigation.”$^70$

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$^59$ Especially noteworthy are the confessions of God’s righteousness by wrongdoers after being punished (e.g. Exod 9:27).
$^61$ Seifrid 2001, 430.
$^62$ Irons 2015, 178.
$^63$ Hill 1967, 104.
$^64$ Palola 2007, 113. Hill (1967, 104) claims “the Greek term retained the flavour of ‘strict justice’ throughout its entire usage” which explains that certain instances of קַדְצ were translated in the LXX with ἐλεος (ἐλεος, ‘pity’) and ἐλεημοσύνη (ἐλεήμοσυνη, ‘mercy’).
$^65$ Seifrid 2004, 39 (who does not specify which manuscript or critical edition is used). The δι- root is sometimes also used to translate other Hebrew terms such as יִשְׁר (jšr, “straight forward”, “upright”) and, on nine occasions, קָדֵש (ḥsd, “an act of kindness or loyalty between people” or “the steadfast loyal love of Yahweh for his people”) (Hill 1967, 105–107).
$^66$ Ziesler 1972, 67.
$^67$ Hill 1967, 108–109. The other changes were that the δι- root became to be used of the divine, whereas secular Greek made this connection only in very early times. Also, while both use the word group for conformity with a standard, in classical Greek this standard is social but in the Septuagint it is divine.
$^68$ Irons 2015, 74–75.
$^69$ Irons 2015, 83.
Seifrid lists some ways that the numerous translators of the Septuagint both retained and changed the meanings of the Hebrew Bible. Perhaps most noteworthy is his conclusion that the Septuagint often retains the forensic sense of the בָּשָׂם and the idea of vindicative justification, which, according to him is a major difference between Hellenistic and biblical usage. As for changes, Seifrid notes that the book of Job offers an ethicizing translation and the Psalms of Solomon lay aside vindicative connotations stressing retributive language instead. Seifrid also stresses that בָּשָׂם is never translated with σωτηρία (sōtēria, ‘salvation’).\(^70\)

It is fruitful to turn to the distant reading methods and to compare the usage of the term in the Septuagint with non-biblical Jewish authors writing in Greek, such as Philo and Josephus. As before, we can focus on 10 terms with the highest TFIDF values (see Table 5). It appears that the usage by Philo and Josephus is closer to that observed in the case of classical Greek authors like Isocrates or Aristotle than to the Septuagint. Similarly to these classical authors, there is again an explicit association with ἀρετή. In addition to that, Philo’s list includes σοφροσύνη and ἀνδρεία, which he shares with Aristotle. To some extent, this matches the analysis by Seifrid, according to whom “a major shift away from the biblical perspective” took place with Josephus (as well as Philo), who uses righteousness language in the Greek sense and describes righteousness as a virtue to be learned and practiced.\(^71\) Furthermore, it appears that in Josephus there is a close connection of righteousness with a religious domain, since the two terms with the highest TFIDF value are εὐσέβεια and θεός. On the surface, from these three subcorpora, the punitive element appears to be most clearly present in the Septuagint through an association of righteousness with κρίμα and κρίνω. Thus, it may challenge Seifrid’s claim of the dominance of vindicative rather than punitive righteousness in the Septuagint. However, further measures are needed to determine the actual ratio between punitive and vindicative use here.\(^72\)

<table>
<thead>
<tr>
<th>author</th>
<th>10 terms with highest TFIDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Septuagint</td>
<td>κρίμα, ποιέω, κύριος, ἀλήθεια, θεός, ἀδικία, ὁδός, κρίνω, ἀνομία, λαός</td>
</tr>
<tr>
<td>Philo</td>
<td>φρόνησις, ἀρετή, σοφροσύνη, ἀνδρεία, ὁσιότης, ἀδικία, εἰμί, ἀγαθός</td>
</tr>
<tr>
<td>Josephus</td>
<td>εὐσέβεια, θεός, εἰμί, ἀρετή, δόξα, πολύς, ἀμάνου, ἄλλος, οὗτος, ἀνήρ</td>
</tr>
</tbody>
</table>

Table 5: 10 terms with highest TFIDF in Septuagint, Philo, and Josephus.

4. Righteousness in Paul

The meaning and role of righteousness in Paul’s writings has been the source of vigorous scholarly debate for centuries. Paul has often also been the starting point for theories

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\(^70\) Seifrid 2004, 49–52.

\(^71\) Seifrid 2004, 45–49. According to Seifrid, Philo and other Hellenistic Jewish authors yield similar results.

\(^72\) See, for example, the vindicative use in Ps 7:9 and 72:1–2.
concerning righteousness in the Hebrew Bible and the Septuagint. Irons, for example, points out that the covenantal theories of righteousness began with Paul and spread from there to the Septuagint and Hebrew Bible. The continuity or discontinuity between (and beyond) these writings is, indeed, a major question for any study on the matter.

![Figure 3: Proportional counts of δίκαιος, δίκη and δικαιοσύνη across LAGT subcorpora.](image)

Looking at the proportions of usage of δίκαιος, δίκη and δικαιοσύνη across various subcorpora (See Figure 3), we observe that Paul’s preference for δικαιοσύνη is exceptional. It cannot be explained either by his relying on Jewish or “pagan” Greek sources. Paul’s usage even skews the overall usage of these terms within the New Testament.

Before discussing the semantic meaning of δικαιοσύνη language in Paul, it is important to note that the relative centrality of the theme in Paul has been much debated. While later Western Protestantism insists on the centrality of the concept, this does not reflect Paul’s message in its original setting. On the contrary, it has been argued since the time of Albert Schweitzer and William Wrede that Paul’s “theology” centers on the idea of the believer’s participation in Christ and that the concept of righteousness is only a “subsidiary crater”. It has been suggested that righteousness is “a polemical doctrine” taken up by Paul mainly in debates with so-called Judaizers concerning the requirement of the Mosaic law on Gentiles.

Philip Esler, for example, notes that righteousness terminology is completely missing from Paul’s first letter, 1 Thessalonians, where Paul even replaces the concept with other terms when alluding to Scriptural passages. This may mean that Paul approached people of gentile

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74 Schweitzer 1998 [orig. 1931], 225.
75 Wrede 1907, 122. For discussion, see Nikki 2019, 185–186.
76 In 1 Thess 5:8 Paul alludes to Isa 59:17, Wis 5:18, but replaces the term righteousness with faith and love (Esler 1998, 156–157).
background with a different type of message, one overall less embedded in Scriptural content. Esler suggests that before Galatians and the debate described therein “[Paul] already had a well-developed theology in 1 Thess, and now [in Galatians] he seeks to re-work this in relation to the acquisition of righteousness. The reactive nature of his procedure is apparent.” Esler argues that the concept of righteousness was widely applied in Second Temple Judaism as a symbolic descriptor of the positive distinctiveness of Jewish identity in relation to Gentiles. Paul’s aim in Galatians, in particular, is to appropriate this valuable term for his own group. Esler thus stresses the fluidity of the term, which does not, however, nullify an attempt to construct some kind of general logic to Paul’s use of the concept.

E.P. Sanders, a pioneer of the covenantal understanding of righteousness, sees Paul’s use of the concept in terms of his model of covenantal nomism, where inclusion in God’s people is “by grace,” as it were, and law observance is necessary to remain in this relationship. What separates Paul from Scriptural usage in Sanders’s model is the way Paul places righteousness and Law observance on the “getting in” side of the covenant (“by the works of the law no one will become righteous”, Gal 2:16), whereas for the Hebrew Bible and the Septuagint righteousness is covenant maintenance language (“staying in”). Partly at least, this can be viewed as Paul’s polemical effort to portray his opponents and Judaism in general as promoting “works righteousness”. For Sanders, too, Paul’s use of righteousness is reactive and not constitutive. Paul emphasizes the lack of righteousness in all people (Rom 1:18–3:20) as a result of his leading conviction that Christ is the savior of all humankind: it follows from this that every person must be in need of salvation.

Seifrid criticizes Sanders’ covenantal understanding of righteousness. He disagrees with Sanders’s basic idea that all Jews were considered righteous on the basis of their membership and “normal” actions in the covenant, and that God rejected these “works of the Law,” because he wanted to save Gentiles through faith in Christ. According to Seifrid, the boundary between righteous and unrighteous was not drawn between Jews and non-Jews, but often within the Jewish people, which creates room for a normative use of the term. Most importantly, Seifrid questions the mutual exclusivity of covenantal nomism and judicial interpretations, stressing that Paul did not find all people sinful after his discovery of Christ as savior, but simultaneously with it. Overall, Seifrid argues that Paul follows biblical rather than extra-biblical Greek usage of the term. With his emphasis on vindicative righteousness (e.g., 1 Cor 6:11) Paul differs, for example, from Josephus’ Hellenistic usage of the term.

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77 Esler 1998, 171.
79 Importantly, the covenant also includes atonement measures to be used in case of transgression. For a summary of covenantal nomism, see Sanders 1977, 422–423. The background of the discussion arises from the longstanding misrepresentation by Christians of Jews as promoting legalism and works-righteousness.
80 Sanders 1977, 205, 624–625; 1983, 45.
81 Nikki 2019, 182.
82 Sanders 1977, 443.
83 According to Seifrid (2004, 64–65), only “figures of notable piety from the past” were considered righteous and when the “righteous” are contrasted with the “wicked” for example in Psalms, it is a matter of obedience to the law.
84 Seifrid 2004, 52.
As we proceed to the application of distant reading to the research problem, it should be emphasized that when applying this sort of method to such a small and widely studied collection of documents as the letters of Paul, we can hardly expect the methods to produce substantially new insights. In this context, the application of these methods rather serves to validate them, enabling us to explore to what extent our methods are able to capture certain semantic features. As above, we begin by looking at the 10 terms with the highest TFIDF values within sentences containing the term δικαιοσύνη (Table 6). First, we observe here a connection with πίστις (pistis, ‘faith’, ‘trustworthiness’) and πιστεύω (pisteuō, ‘to believe’, ‘trust’), which may refer to covenant fidelity.\(^{85}\) A close association is also observable between δικαιοσύνη and νόμος, which can be interpreted either in covenantal or judicial vein. In this context we should also note the prominent position of ἁμαρτία (hamartia, ‘sin’), which is also open to interpretation.\(^ {86}\) We should hesitate to construct any strong conclusions based on these distant reading observations. First of all, we decided to focus on 10 terms for our comparison; had we decided to focus on 5 or 15 terms instead, we could have observed slightly different patterns.

<table>
<thead>
<tr>
<th>author</th>
<th>10 terms with highest TFIDF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paul of Tarsus</td>
<td>πίστις, ἁμαρτία, νόμος, λογίζομαι, θεός, βασιλεύω, δοῦλος, παρίστημι, πιστεύω, Χριστός</td>
</tr>
</tbody>
</table>

*Table 6: 10 terms with highest TFIDF in Paul*

To elaborate these observations further, we can now employ another distant reading method: word co-occurrence networks. As sketched in II. Data and Methods, we can easily generate a word co-occurrence network from a word-word co-occurrence matrix capturing co-occurrences of any two words within a list of sentences. This way we can create a word co-occurrence network for each author in our dataset. With such a network, we can explore the network position of the term δικαιοσύνη in respect to other terms.

Since the network consists of a substantial number of nodes, making it difficult to inspect it visually, we subsequently focus only on a small part of it, namely the immediate neighborhood of the term δικαιοσύνη in the network. In Figure 4, we see such a subnetwork for Paul’s authentic letters. This subnetwork has been extracted in the following way: first, the algorithm extracted 5 nearest neighbors of the key term δικαιοσύνη (nearest neighbors are terms most commonly appearing together within sentences). Subsequently, for each of these 5 terms, this procedure was repeated, as we extracted their own 5 nearest neighbors. In principle, this procedure can generate 31 terms in total. However, in practice, this number is usually significantly lower, since there are overlaps between the terms.

\(^{85}\) For the changing meanings of faith terminology in Rom (which can at times even be viewed as parallel to δικαιοσύνη), see e.g. Sanders 1977, 490–491.

\(^{86}\) For sin as disobedience in a covenant context, see Sanders 1977, 111–116.
We see that the nodes within the subnetwork are to a large extent the same as the ones we have among the 10 terms with the highest TFIDF (Table 6). In this case, however, the terms are accompanied with structural information. It has been suggested that the structural information captured by word co-occurrence networks might be used as a proxy for word association networks. Thus, for instance, we observe that δικαιοσύνη is strongly associated with πίστις, ἁμαρτία, and νόμος. This combination is unsurprising in the light of Paul’s typical argumentation concerning the role of faith to the exclusion of the law in attaining righteousness (e.g., Gal 3:21-22; Rom 3:21-22, 4:13; 9:30-31, 10:5-6). But this is not all. We further see the nearest neighbors of these terms. In particular, we see that νόμος maintains a close association with πίστις. This is expected since they represent diametrically opposing paths to righteousness (see Phil 3:9). Another interesting aspect of this subnetwork is the usage of ἁμαρτία, which appears to be closely associated with νόμος and δικαιοσύνη, but not with πίστις. In addition to that, ἁμαρτία mediates a connection with θάνατος (thanatos, ‘death’) and σάρξ (sarx, ‘flesh’), denoting mortality and corporality. The advantage of word co-occurrence networks is the ability to capture structural properties of the semantic relationships. However, it is more

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Figure 4: Subnetwork consisting of nearest neighbors surrounding the term δικαιοσύνη within the co-occurrence network based on the authentic letters of Paul (see the main text for a more detailed explanation).

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87 Galea & Bruza 2015. The nearest neighbors of a term within such a network might serve as an approximation for terms closely associated with the term in mind of the writer. In effect, we can imagine that reading of these texts can modify association networks in the minds of the readers (or listeners). Thus, word co-occurrence networks might be viewed as “models of the network of associations that the text generates in the readers’ or listeners’ minds” (Czachesz 2016, 45).
challenging to use this method to compare such semantic relationships across more authors, because of the limited comparability of the networks.  

To proceed further, we will introduce other distant reading methods, which will allow us to compare quantitatively Paul’s usage of the term δικαιοσύνη with the usage of other authors. Again, we will draw on the TFIDF measurement employed above. But this time we will do so in a much more elaborated way, combining it with vector semantics. Drawing on the distributional hypothesis, we assume that when two authors use similar terms in the context of the term δικαιοσύνη, this implies that they also tend to understand the term δικαιοσύνη in a similar way.

As explained in section II, distributional semantics typically transforms textual data into their vector representations. Such vector representations might be mathematically analyzed and subjected to a comparison. Following this logic, a list of TFIDF values of terms appearing within sentences containing the term δικαιοσύνη within works from one author can be treated as a vector, defining one particular position of a point in a multidimensional space. This allows us to compare TFIDF values of a list of terms across more than one author, with values of each author being represented by one point in a shared multidimensional space. This position is then subjected to a comparison. A standard measurement for this comparison is cosine similarity, which compares any two vectors by measuring the angle between them. As an output of the cosine similarity measurement, we obtain a similarity matrix comparing any two authors under consideration. Our dataset as a whole consists of 269 authors, which ultimately corresponds to a similarity matrix with 269 columns and 269 rows. Since it is difficult to inspect such a matrix visually, here we focus only on its subselection consisting of authors or subcorpora we discussed in the previous sections: Isocrates, Aristotle, the Septuagint, Philo, Josephus, and Paul (Table 7).

<table>
<thead>
<tr>
<th></th>
<th>Isocrates</th>
<th>Aristotle</th>
<th>Septuagint</th>
<th>Flavius Josephus</th>
<th>Philo Judaeus</th>
<th>Paul of Tarsus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isocrates</td>
<td>1</td>
<td>0.50845</td>
<td>0.25758</td>
<td>0.49441</td>
<td>0.57362</td>
<td>0.15754</td>
</tr>
<tr>
<td>Aristotle</td>
<td>0.50845</td>
<td>1</td>
<td>0.26054</td>
<td>0.36762</td>
<td>0.63929</td>
<td>0.15322</td>
</tr>
<tr>
<td>Septuagint</td>
<td>0.25758</td>
<td>0.26054</td>
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<td>0.32254</td>
<td>0.30049</td>
<td>0.32178</td>
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<tr>
<td>Flavius Josephus</td>
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<td>1</td>
<td>0.43474</td>
<td>0.23478</td>
</tr>
<tr>
<td>Philo Judaeus</td>
<td>0.57362</td>
<td>0.63929</td>
<td>0.30049</td>
<td>0.43474</td>
<td>1</td>
<td>0.17135</td>
</tr>
<tr>
<td>Paul of Tarsus</td>
<td>0.15754</td>
<td>0.15322</td>
<td>0.32178</td>
<td>0.23478</td>
<td>0.17135</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 7: Similarity matrix – a subselection of pre-Christian authors and Paul*

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88 The limited comparability of word co-occurrence networks is caused by the fact that their size (number of nodes) and density (number of edges) is proportional to the size of the input textual data. For instance, these differences disable application of standardized network measurements, like betweenness centrality of a certain node (e.g., the term δικαιοσύνη), across such networks, what would be otherwise very valuable information.

89 The number of dimensions equals the number terms on the list.

90 Cosine similarity relies on the dot product operator, which guarantees that the similarity value will be high only when the two vectors have large values in the same dimensions, and not when they share a lot of zero values. Cf. Jurafsky and Martin 2017, 279–281.
The similarity values have to be always interpreted in relational terms, since the value depends on the size of the vocabulary and the extent to which this vocabulary is shared across authors. We should not be surprised by the relatively high similarity values connecting Isocrates and Aristotle. We could be perhaps more surprised by the extent of similarity between Philo on the one hand and Aristotle with Isocrates on the other (0.57362 and 0.63929 respectively). In the case of both Josephus and Philo, we observe a higher similarity with classical authors than with the Septuagint. Paul reveals the highest similarity with the Septuagint (0.32178), not only within this subselection of authors, but among all pre-Christian extra-biblical texts in our dataset. However, the extent of this similarity (0.32178) is still lower than the one we observe between Philo and Josephus and the classical authors. On the one hand, the results affirm the distance between Paul and extra-biblical Greek authors, but on the other hand, it also sets Paul apart from biblical language. The complexity, even obscurity, of Paul’s argumentation on righteousness has made scholars look to biblical texts for answers. Our results suggest that this should be done cautiously, since Paul also diverges from previous tradition.

5. Righteousness in early Christianity

Brian J. Arnold seeks to find out how the theme of righteousness was received in second century Christianity. A common view is that Augustine was the “fountainhead” of the doctrine of justification, whence it found its way to Luther. The earliest church fathers, on the other hand, are considered to offer very little on the issue. This view is related to the question of whether Paul was used in the second century by the “mainstream” Christians or left in the hands of “heretics,” as suggested by the Tübingen school and Adolf von Harnack. Indeed, Paul’s strong influence on Valentians, for example, has been widely recognized since the pioneering work by Elaine Pagels. Arnold analyses the idea of justification in Clement of Rome, Ignatius of Antioch, Epistle to Diognetus, Odes of Solomon, and Justin’s Dialogue with Trypho and concludes that the alleged gap between Paul and Augustine is one of scholarship and not of sources. According to Arnold, the second-century fathers “believed in justification by faith, and … their view was consistent with the so-called ‘traditional’ reading of Paul. They tend to present their view of justification forensically and often contrast justification with works-righteousness. Additionally, they use other doctrines associated with Paul, such as imputation and substitutionary atonement.” Arnold believes to have proven that “[t]he Apostle was not hijacked by either the proto-orthodox or the Gnostics—he was used by every group despite their varying theological persuasions.” Other scholars have also rejected the extreme position of 19th century scholarship and replaced it with a recognition of Paul’s influence on a variety of strands of early Christianity. Importantly, Arnold does not consider the occurrence of δικ-terminology or explicit references to Paul to be decisive for detecting

91 Anne Pasquier (2004, 459) has recently stated that “[t]he history of interpretation of Paul’s Letters during the second century, it has been said, is essentially the history of Gnostic exegesis.”
92 Unfortunately, Valentinian works in Coptic are beyond the scope of this article.
94 Arnold 2017, 4.
95 Arnold 2017, 10.
ideas related to righteousness in the early fathers. Moreover, Arnold makes no claim as to the correct understanding of Paul’s righteousness theology or how faithfully the second century fathers reproduce Paul’s ideas. Our analysis below suggests significant differences in the treatment of righteousness between these authors.

Nick Needham looks at righteousness language by early church fathers from a wider perspective of the first four centuries. He notes “a very prominent strand of usage in which [justification/righteousness] has a basically forensic meaning” and a more modest strand where the concept is understood as moral transformation and “sanctification.” The forensic meaning manifests as “a not-guilty verdict, an acquittal, a declaration of righteousness, a nonimputation of sin, an imputation of righteousness.” A good example of forensic thinking is John Chrysostom, who ventures a (markedly anti-Jewish) definition of justification: “What does the word ‘justified’ mean? That if there could be a trial and an examination of the things He had done for the Jews, and of what had been done on their part towards Him, the victory would be with God, and all the right would be on His side.” The forensic and vindicative outlook is evident also in the way the fathers treat “justification” and “condemnation” as equal opposites: “Whom God has condemned, who shall justify?” exclaims Athanasius. According to Needham, the fathers also view justification against other concepts from the forensic domain, such as “guilt”. The fathers also identify justification with “forgiveness, remission, pardon, or acquittal.” Thus Origen: “If anyone acts unjustly after justification, it is scarcely to be doubted that he has rejected the grace of justification. For a person does not receive the forgiveness of sins in order that he should once again imagine that he has been given a license to sin; for the remission is not given for future crimes, but for past ones.”

The forensic outlook, according to Needham, often takes in the early fathers the form of imputation, that is, “reckoning or crediting something to someone’s account, a synthesis of legal and financial metaphors, where the books that are being kept are ‘judgment books.’” The idea of nonimputation of sins was, however, more common than that of imputation of righteousness. Furthermore, Needham emphasizes that the idea of atonement as penal substitution by Christ is already visible in the fathers, for example, in Justin Martyr, and particularly strongly in John Chrysostom.

Arnold 2017, 5. Paul’s influence can be detected, for example, in various arguments that use Abraham as legitimation for righteousness, since the argument is originally coined by Paul (Arnold 2017, 11). According to Arnold, “[e]ven though a particular author may not use δικαιοῦμαι or δικαιοσύνη, the concept of justification may still be present. (...) It is no problem, then, to hunt for justification’s tracks even where the word itself is absent.” (2017, 5). These contexts might be captured by some word-embeddings methods as well. However, to work properly, these methods require much more extensive textual data than we possess for the second century Christian authors and therefore we cannot employ them for this task here.

Needham takes Clement of Alexandria as a significant exception of the fathers in general, since justification for him almost exclusively denotes “sanctification” or moral conduct (2006, 37).

Needham 2006, 36.

Needham 2006, 28. Needham takes Clement of Alexandria as a significant exception of the fathers in general, since justification for him almost exclusively denotes “sanctification” or moral conduct (2006, 37).

Needham 2006, 36.


Athanasius, To the Bishops of Egypt 19. See Needham 2006, 29.

Origen Romans 3.9.4. See Needham 2006, 30.

Needham 2006, 32 offers examples from authors such as Clement of Rome, Justin Martyr, Irenaeus, Clement of Alexandria, Apostolic Constitutions, Ambrose, John Chrysostom.

Needham 2006, 33.

Needham 2006, 33–35. Unfortunately, John Chrysostom is not included in the AGT corpus.
As a next step, we look at the early Christian authors in the AGT corpus employing the same distant reading method we employed in the case of comparing with a subselection of pre-Christian authors and subcorpora: comparing cosine similarity of TFIDF vectors based on terms appearing in sentences containing the term δικαίωσις. In total, the AGT dataset contains 30 early Christian authors from the first 4 centuries. However, only 26 of them use the term δικαίωσις. To have a broader picture and for the purposes of comparison, we will also include Philo of Alexandria and Josephus Flavius. Thus, we will construct a similarity matrix based on 28 authors or subcorpora.

A matrix of this extent (28 rows and 28 columns) becomes too large to be effectively explored by visual inspection here. Thus, we can inspect this similarity matrix by means of a network instead. For this purpose, the similarity matrix can be treated as an adjacency matrix defining nodes and edges for a network, with individual cell values representing edges’ weights (see Figure 5). Since such a network tends to be very dense (zero similarity values are rare) and therefore not very informative, we have to set up a cut off threshold for minimal accepted weight to construct an edge. Figure 5 uses a cut off threshold equal to 0.37.

Figure 5: Similarity networks of authors based on cosine similarity of TFIDF vectors.

In the network depicted on Figure 5 we observe Paul is connected to 3 other authors: Epiphanius, Eusebius, and Origen. These are authors with whom he has the highest similarity

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106 Unfortunately, the works of John Chrysostom or the Epistle to Diognetus are missing in the corpus.
107 An undesired consequence of applying such a cut off threshold is that it removes some nodes from the network. For instance, in our case, the threshold equal to 0.37 leads to removal of a node representing Deutero-Pauline literature, since all similarity values connecting it to other nodes within the network are lower than this threshold.
value based on the TFIDF vectors. In other words, these authors use the term δικαιοσύνη most similarly to Paul. It is striking that all three were active either in the 3rd or 4th century and that Paul is not tied with any first or second century author. This creates distance between Paul and the second century writers, who understood righteousness in a legal sense. Adding the coptic works from Nag Hammadi to the analysis would be relevant for the classic question of “Pauline captivity” by the “heretics”. What is further remarkable is the position of Josephus and Philo: both are quite close to the center of the network. In fact, with the cut-off threshold equal to 0.37, Philo maintains the only tie connecting Hippolytus with the rest of the network. Finally, the most central position with the network is occupied by Origen, maintaining ties both to authors preceding him and following him.

IV. Conclusion

The interpretation of righteousness terminology in Paul and surrounding literature is a hotly debated topic of the New Testament and early Christian studies. The contribution of the article to this academic debate is two-fold. First, we repeatedly demonstrated that the distant reading methods return results highly comparable to results achieved by close reading. One example is the close association between righteousness and virtues in the works of Isocrates and Aristotle observed by distant reading but also noted by Charles Lee Irons. The graph of the temporal distribution of δικαιοσύνη is also aligned with Irons’s view that this term was frequently used outside Greek biblical texts. These are very relevant results as they validate the applicability of the methodological combination of close and distant reading and reveal the potential of this approach to shed new light on the arguments present in these debates. Second, even despite the fact that we did not go very deep into the quantitative results, they already point to interesting trends in the texts that can be further explored in future research into this topic. Especially the future elaboration of the network analysis focusing on the shared righteousness-vocabularies of the words with highest TFIDF among the early Christian authors represents a promising path to study the writing of these authors and their usage of terms associated to righteousness in the contexts of relationships they form on textual level. Despite the significant potential of distant reading, we are aware of its limits with respect to incomplete historical data or difficult lemmatization processes and we do not propose to apply these quantitative tools in methodological separation from close reading, on the contrary, functional distant reading requires insights from close reading both in the input phases of the analysis as well as during the interpretation of the results.

For future work, we are also aware of other contexts that can contribute to these textual trends such as the degree of affluence in the society or shifts in meaning related to different cultural translations of righteousness. For example, ancient coins might be a relevant medium for future exploration as they reveal one relevant issue with respect to depicting righteousness. On coins of the Roman Empire, the goddess Dikaiovsyne is depicted identically as the Roman goddess Aequitas, that is, as standing and holding scales in one hand and cornucopia in the other.108 If Roman society perceived and understood Dikaiovsyne based on the aspects of

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108 http://numismatics.org/ocre/, https://rpc.ashmus.ox.ac.uk/
Aequitas it would be relevant to explore how this could have affected the use of terms associated with righteousness in the texts analyzed in the present article. The level of affluence in society in the years of an ancient author’s writing activities is also a promising context for future academic scrutiny as the academic debate produced hypotheses suggesting that morally loaded terms are more easily upheld and transferred in more prosperous and affluent times.\(^\text{109}\)

Both these factors (iconography on coins, level of affluence) can be also approached quantitatively in potential future enquiries into this topic. Based on the iconographic interchangeability between Dikaiosyne and Aequitas on Roman coins, we can explore by the methods presented in this article whether there are aspects related to the goddess Aequitas present in the word contexts surrounding righteousness in the works Christian authors active in the era of the Roman empire. With respect to the affluence hypothesis, it is possible to estimate the potential level of affluence in the society based on a variety of economic proxies (e.g., wages, degree of urbanization, population growth, times of infectious diseases, etc.).\(^\text{110}\)

and then add an attribute to early Christian writers indicating whether the author wrote in years of affluence or crisis. Then it can be observed if this factor could have potentially had an impact on the righteousness vocabulary of these writers and whether it is possible to identify specific tendencies in their vocabulary contrasting with authors writing in times and environments with different levels of affluence.

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**Bibliography**


\(^{109}\) Baumard 2015.

\(^{110}\) Ober 2015.


